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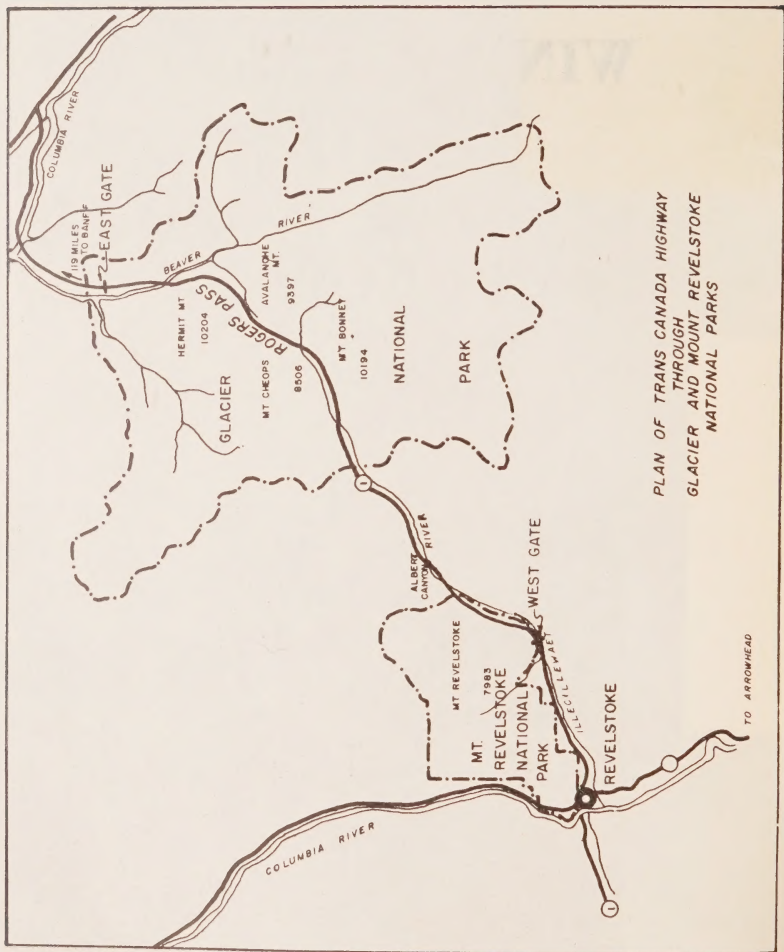
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ROGERS PASS SECTION, TRANS-CANADA HIGHWAY



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PLAN OF TRANS CANADA HIGHWAY
THROUGH
GLACIER AND MOUNT REVELSTOKE
NATIONAL PARKS

TO ARROWHEAD

THIS guide is prepared for the information of drivers crossing Rogers Pass on the Trans-Canada Highway. Many of you will have driven over mountain roads in winter before and know the usual precautions to take. However, Rogers Pass is different. The highway crosses 74 avalanche sites between the east boundary of Glacier National Park and Albert Canyon, and special procedures have been developed to protect motorists and keep the road clear for traffic.

An understanding of the techniques involved in keeping the highway open will help make your drive more interesting and even somewhat of an adventure. And, if you follow the few simple instructions given in this booklet and accept the guidance of the National Parks Service officers on duty, you will travel the Rogers Pass in winter as easily and conveniently as you drive over any other highway after a heavy snowfall.

Look around you as you enter Rogers Pass and you will realize the problems that are presented to winter highway maintenance. The summit of Rogers Pass is 4,300 feet above sea level and the peaks of the Selkirk Range rise steeply above the narrow pass to elevations of 11,000 feet. Snow building up on the mountain slopes can slide under certain conditions and cascade

down the mountain-sides to the valley and the road below, closing it to traffic.

Even with this sort of terrain, there would not be many avalanches unless there were a heavy snowfall. Rogers Pass in Glacier National Park has one of the heaviest snowfalls in the world. The average snowfall is 342 inches but the maximum recorded snowfall was 680 inches in the winter of 1953-54. Heavy snowstorms are not frequent, though, and do not last long; only once every three years is there a storm that yields more than 36 inches of snow in a three-day period. With practically every snowfall, there is wind, and large amounts of snow pile up on the lee side of the mountains. It is these accumulations of snow that turn into avalanches.

The possibility of your vehicle being caught by an avalanche is slight but you should be aware there is always risk in crossing avalanche slopes. The elaborate safety procedures minimize this risk. You may be delayed while an avalanche is being brought down or stabilized, or the highway is being cleared of snow from an avalanche. The purpose of the elaborate avalanche warning and defence system is to keep these delays as few and as short as possible.

WHO MAINTAINS THE HIGHWAY?

A glance at the map on the inside cover will show that the Trans-Canada Highway passes through two National Parks—Mount Revelstoke and Glacier—between Revelstoke and Golden. Twenty-seven miles of this section of the highway are in Glacier National Park, eight miles in Mount Revelstoke Park, and about eleven miles between the two National Parks on provincial land.

On other parts of the Trans-Canada, the National Parks Branch maintains the sections that lie within National Park boundaries, while other sections on provincial land are maintained by the appropriate provincial highways department.

For more effective deployment of highway maintenance equipment, the Natural and Historic Resources Branch and the British Columbia Department of Highways evenly share the responsibility for highway maintenance on a mileage basis; the Natural and Historic Resources Branch maintains the highway from Quartz Creek, which is eight miles east of the eastern entrance to Glacier National Park, to the west boundary of Glacier. The British Columbia Highways Department maintains the highway from the west boundary of

Glacier National Park to the city of Revelstoke, including the section through Mount Revelstoke National Park.

Because it is in Rogers Pass in Glacier National Park that the majority of the avalanches occur, the Natural and Historic Resources Branch provides the avalanche detection and warning system. National Parks officers work on close co-operation with the British Columbia highway maintenance staff so that the maintenance of the entire section of the highway is tightly co-ordinated. Motorists need be aware only that between Revelstoke and the west boundary of Glacier National Park it is the British Columbia Highways Department that is responsible for highway maintenance and traffic control; between the west boundary of Glacier and Quartz Creek, officers of the Natural and Historic Resources Branch are concerned with the safety and convenience of motorists.

AVALANCHE DEFENCES

When the route through Rogers Pass was selected, it was recognized that avalanches would be the main problem and the federal Department of Public Works, which was responsible for the construction of the entire sections of the highway

that are in Glacier and Mount Revelstoke National Parks, organized a preliminary survey of avalanche sites and avalanche activity in 1953.

In 1956, an avalanche observation station was established with the assistance of the National Research Council and P. A. Shaerer, a Swiss engineer, was employed by the N.R.C. to take charge of the observation station on Mount Abbott and plan the avalanche defences. The station is now located on Mount Fidelity.

The most obvious of the avalanche defences are the nine concrete snowsheds—six in Rogers Pass and three just west of Glacier National Park on the part of highway built by the British Columbia Highways Department. In Rogers Pass, most avalanches terminate right on the highway, and some method had to be developed to keep the heavy masses of snow off the highway. The concrete snowsheds are the most effective protection against avalanches and are placed at the severe slide areas to carry the avalanche over the top of the highway and support the weight of the deposited snow.

There are other defences that are not particularly noticeable in winter. Mounds of rubble, 15 to 25 feet high, rise on a checkerboard pattern on sections of avalanche slopes that are flatter. These

break up the avalanche and draw off much of its force before it reaches the highway. High on the mountain sides are flat benches, some 1,000 feet long and 150 feet wide, that catch and hold lesser snow-slides. Immediately above the snowsheds are diversion dams to keep the avalanches from fanning out beyond the width of the sheds.

AVALANCHE RESEARCH AND WARNING

To make a military analogy, the avalanche defences of the Roger Pass are defence in depth. There are the static defences of the snowsheds and other structures and the ever-ready crews of men with heavy machinery to clear the road when an avalanche breaks through the defences. The third basic element in the defence is the avalanche warning and research section which performs an intelligence and reconnaissance function—knowing when avalanches are likely to fall and taking action to alert the defences and minimize the effect of the snow-slides..

In 1959, the Natural and Historic Resources Branch, Department of Northern Affairs and National Resources, accepted the responsibility for avalanche prediction. A snow research and ava-

lanche warning section was set up under the direction of a qualified snow analyst.

The snow analyst and his technicians are on duty 24 hours a day during the avalanche seasons. Their headquarters is high on Mount Fidelity, close to the elevations where the first breaks occur in the snow cover and lead to avalanches.

Experience in avalanche evaluation at Rogers Pass since 1956 has enabled the snow research and avalanche warning section to recognize the various factors that create avalanche conditions and calculate the probability of an avalanche occurring on the various sites. Automatic telemetering equipment at two high-altitude observatories records wind direction and velocity and air and snow temperatures and transmits this information to the snow research headquarters on Mount Fidelity. This information, together with on-the-spot investigations of snowcover on the mountains, enables the research and warning group to give advance notice of the likelihood of avalanches.

SNOW STABILIZATION

When avalanches are likely to occur, the slopes must be stabilized. This is done by the use of explosives detonated in the trigger zone of an

avalanche. This method has been employed effectively and economically in Switzerland and the United States. The technique in Rogers Pass is to use explosive projectiles fired from a 75 mm. or 105 mm. howitzer manned by a detachment of the Royal Canadian Artillery.

The explosion of the projectile in the trigger area can have two effects. Either the snow comes down as a minor avalanche or it settles into the cracks and crevices and will not come down until conditions change. The reason there is only a minor avalanche is that explosives are detonated each time the areas become unstable, and prevent a large accumulation of snow from building up and causing a major avalanche.

Along the highway, you will see about 15 areas on the shoulder of the road that are kept free of snow. These are the gun positions, from which the howitzers are fired. The decision to fire on a potential avalanche is made by the analyst of the snow research and warning section. There is usually a two or three hour advance warning. During the period the gun is firing, the highway will be closed and no traffic will be allowed to enter the proximity of the danger area.

GENERAL ADVICE TO MOTORISTS

When you enter Glacier National Park, the gateway attendants will advise you if there is an avalanche hazard and if the gun is being put into action. They will also give any other information that will assist you.

As you drive on and if the gun is ready for firing before you have cleared the danger zone, you will be stopped well ahead of the danger zone by a Park Warden Patrol. The Park Warden will provide you with an estimate of how long you will be delayed by the shoot. This estimate of the delay cannot be precise; it may be longer or shorter. Again, you can choose to turn back to wait out the delay at Revelstoke or Golden, or stay where you are. Please do not leave your car and try to walk into the firing area for a closer look at the operation.

While waiting, keep your engine off as much as possible. Carbon monoxide can endanger you as well as other drivers who are parked too close to your exhaust. If your engine is running, keep a window open. If a vehicle ahead has its engine running, park far enough behind it so you will avoid exhaust fumes.

The Warden Patrol is in constant touch by

radio with the gun crew and the road maintenance crew, so feel free to keep in touch with the situation ahead through the park wardens. The wardens will make every attempt to keep you well informed on what is happening.

When firing has been completed, you will be allowed to move as soon as it is safe to do so.

Sometimes you may be allowed to move after the artillery fire has stabilized one or two slopes and while the gun is being moved to a new position.

Under this condition, please co-operate by moving away from the area as quickly as possible. Proceed, in convoy style, keeping a safe interval between your car and the vehicle ahead. Stay in line and do not pass or stop until you are cleared to drive at your own discretion by the next Warden Patrol you meet.

Please take note of all warning signs that are posted. All potential danger zones are marked by signs reading "Avalanche Area, Do Not Stop" and "End of Avalanche Area". *Within these areas, do not stop under any conditions.* If your vehicle breaks down and stops within a danger area, wave down any National Parks vehicle or commercial truck for assistance.

If you are forced to make a stop due to a

breakdown, do not leave your car and attempt to walk out. During danger periods, the highway is patrolled 24 hours a day and you will not have to wait long for assistance. At night, keep your parking lights on if you are stopped or, if this is not possible, place emergency flares or reflectors out.

National Parks regulations require that vehicles must be equipped with snow tires or carry adequate chains when there is snow on the highway. Park officials and police have the authority to stop vehicles that are not equipped to cope with the particular type of wet snow conditions encountered in this area. Signs instructing motorists to put on chains will be posted at predetermined points, depending upon the conditions existing at any particular time. The use of chains at these times is most necessary for your own convenience, as well as that of the maintenance crews. Stalled vehicles can hinder the efficient snow plowing of the highway.

In conclusion, please remember that you are driving under unusual conditions when you use the Rogers Pass Section of the Trans-Canada Highway in winter. Your realization of the danger of avalanches, your appreciation of the magnitude

of the engineering works and research that are contributing to public safety and, above all, your co-operation in following the instructions for traffic procedure, will assure that your drive is both interesting and pleasant. You as an individual driver can contribute to the success of one of the most difficult highway maintenance jobs in the world.

Issued under the authority of
HONOURABLE ARTHUR LAING, P.C., M.P., B.S.A.,
Minister of Northern Affairs and National Resources



**NATURAL AND HISTORIC RESOURCES BRANCH
DEPARTMENT OF NORTHERN AFFAIRS AND
NATIONAL RESOURCES**

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QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
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